PATENT ABSTRACTS OF JAPAN

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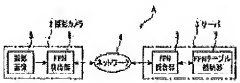
(54) DEVICE AND METHOD FOR SPECIFYING PHOTOGRAPHING CAMERA

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a device and a method for specifying a photograhing camera used for photography by which the photographing camera can be specified by a simple image processing from information about a photographed image itself without adding metadata thereto.



SOLUTION: When the photographing camera 2 fetches the photographed image 5 by photographing an object (not illustrated), an FPN detection part 6 detects a unique FPN included in the photographed image 5 and transmits it to a server 3 via a network 4. The FPN detection part 6 eliminates accidental random noise by detecting FPNs about a plurality of lines in the photographed image 5 and averaging them. An FPN collation part 8 collates the FPN received from the photographing camera 2 with an FPN table in which the FPNs by every photographing camera preliminarily registered in an FPN table storage part 7 are listed and when the FPNs are matched, specifies the photographing camera 2 with the unique FPN corresponding to the received FPN.

CLAIMS

[Claim(s)]
[Claim 1]
It is a photographing camera specific device which captures an image photoed with a camera using an image sensor, and specifies said camera from the picture,
An FPN detection means to detect FPN which is fixed pattern noise peculiar to said image sensor from a picture captured into said camera,
An FPN table storing means which stores FPN of two or more cameras beforehand as an FPN table,
A photographing camera specific device provided with an FPN collation means which carries out comparative collation of FPN detected by said FPN detection means, and FPN for every camera of an FPN table stored in said FPN table storing means.
[Claim 2]
Said FPN detection means,
The photographing camera specific device according to claim 1 performing a time filtering process which detects and adds FPN of two or more frames in a predetermined region of a picture which said camera captured, and sets the average value to FPN of the picture concerned.
[Claim 3]
Said FPN detection means,
The photographing camera specific device according to claim 1 or 2 performing processing corresponding to a level in which FPN of a constant level which is not dependent on an image level of a picture which said camera incorporated is detected.
[Claim 4]
Said FPN detection means,
The photographing camera specific device according to any one of claims 1 to 3 performing

spatial filtering processing in which light and darkness of a picture which said camera captured extract a uniform imaging range, and filter data of this extracted imaging range.

[Claim 5]

Said FPN detection means,

The photographing camera specific device according to any one of claims 1 to 4 performing correlative processing between color channels which detect a portion without correlation as FPN between RGB color channels in a picture which incorporated said camera.

[Claim 6]

Said FPN detection means,

An additivity FPN field primary detecting element which detects additivity FPN which has a constant level without being dependent on an image level of natural pictures in a picture which incorporated said camera,

A multiplication nature FPN field primary detecting element which detects multiplication nature FPN from which a level changes in proportion to an image level of natural pictures in a picture which incorporated said camera,

The photographing camera specific device according to any one of claims 1 to 5 characterized by preparation ******.

[Claim 7]

It is a photographing camera specific method which captures an image photoed with a camera using an image sensor, and specifies said camera from the picture,

A photographing camera specific method specifying a camera which captured a photoed image by matching with FPN peculiar to said image sensor detected from a picture captured into said camera, and FPN for every camera registered beforehand.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the photographing camera specific device and photographing camera specific method which specify the photographing camera using a solid state image pickup device from a taken image especially about the photographing camera specific device and photographing camera specific method for specifying the camera which photoed the image (picture).
[0002]
[Description of the Prior Art]
Video cameras, electronic "still" cameras, etc. using a solid state image pickup device, such as the former and CCD (Charge Coupled Device). In order to specify the photographing camera which took a photograph to the picture photoed by (these are named generically and it is hereafter called a photographing camera), the metadata etc. which are data in which the information attribute about a photographing camera is shown in detail are used widely. For example, there is a graphics format (Exif:EXchangeable Imagefile Format) by which the standard was done as electronic "still" camera-oriented characteristic data and employment regulation in Japan Electronic Industry Development Association (JEIDA). Art of specifying the electronic "still" camera which took a photograph is put in practical use by using the information attribute data of camera ID of the camera which used this Exif and photoed it with the photographing time about the photoed picture, the photographing area, the image color, the focal distance, etc., etc. as metadata. That is, the photographing camera which photoed the image can be specified by storing in a place different from the usual picture image data the metadata which recorded camera ID etc., or embedding it on an image as digital watermarking etc.

[0003]
The art of pinpointing the image of a subject and the position (that is, the camera itself) of a camera with a camera in the following patent documents 1 is indicated. This art acquires the image containing two or more signs with which the camera was installed in the photographing object, and specifies the spatial relation between a photographing object and a camera from the relation between the position of the sign projected on the image, and the absolute position of the sign registered beforehand. In order to raise the recognition rate of a sign at this time, the spatial relation between a photographing object and a camera is more precisely specified by using as a sign the material which is made to reflect specific light or is made to penetrate, and the material which makes specific light emit light.
[0004]
[Patent documents 1]
JP,H11-351826,A (the paragraph number 0013-paragraph number 0020, Fig. 1 - Fig. 6)
[0005]
[Problem(s) to be Solved by the Invention]
However, in the conventional technique of having used the above Exif, the picture and photographing camera which were photoed if metadata was not added to a photographing camera cannot be matched. Therefore, in the method of adding metadata to such a photographing camera, if the metadata concerned is separated from a picture, a photographing camera cannot be specified. In the time of photography, since the information attribute data about a photographing camera must be added as metadata, there is a problem that a photographing camera is not user-friendly (it takes complicated time and effort).
[0006]
In the art of the above mentioned patent documents 1, since advanced Image Processing Division must be performed to a taken image in order to specify a photographing camera, it will become complicated [the whole photographing system] and expensive, and the procedure for specifying a photographing camera will become quite complicated. That is, in a Prior art, there is a problem that a photographing camera cannot be specified from the information on the photoed picture itself without [without it adds metadata to a photographing camera, and] performing advanced Image Processing Division.
[0007]
There is a place which this invention was made in view of above mentioned SUBJECT, and is made into the purpose in providing the photographing camera specific device and photographing camera specific method which can specify a photographing camera from the information on the picture itself photoed by easy Image Processing Division without adding metadata.
[0008]

[Means for Solving the Problem]
In order to attain the aforementioned purpose, it had composition shown below.
The photographing camera specific device according to claim 1 is provided with the following.
It is a photographing camera specific device which captures an image photoed with a camera using an image sensor, and specifies a camera from the picture, and is an FPN detection means.
FPN table storing means.
FPN collation means.

[0009]
According to this composition, a photographing camera specific device, Fixed pattern noise (FPN:Fixed Pattern Noise) peculiar to an image sensor detected from a picture which a camera photoed by an FPN detection means, A camera which photoed the picture concerned is specified by matching FPN for every camera beforehand stored in an FPN table storing means as an FPN table (registration) by an FPN collation means. Thus, by specifying a camera which performed photography from the picture itself, a camera can be specified uniquely, without adding metadata etc. to a camera. Therefore, it can be specified easily with which camera a desired picture was photoed, without performing performing complicated work sequence and advanced Image Processing Division according to this photographing camera specific device.
[0010]
The photographing camera specific device according to claim 2, In the photographing camera specific device according to claim 1, in a predetermined region of a picture which said camera captured, said FPN detection means detects and adds FPN of two or more frames, and a time filtering process which sets the average value to FPN of the picture concerned is performed.
[0011]
Since according to this composition a photographing camera specific device is an FPN detection means, only two or more frames in 1 picture detect and add FPN of a lengthwise direction and the average value is calculated as FPN of a picture, random noise peculiar to one line can be reduced to two or more [1/]. That is, by calculating average value of FPN from an output of two or more frames, random noise accidentally generated on one frame can be removed, and FPN of a picture can be detected.
[0012]
Processing corresponding to a level in which the photographing camera specific device according to claim 3 detects FPN of a constant level which is not dependent on an image level of a picture with which said camera incorporated said FPN detection means in the photographing camera specific device according to claim 1 or 2 is performed.

[0013]
According to this composition, it is an FPN detection means, and by performing processing corresponding to a level, a photographing camera specific device pinpointed a field whose level is black in a large imaging range, and it was not dependent on an image level and it has detected FPN which is a constant level from level dispersion of a pixel in the specific region. FPN is correctly and easily detectable by performing such processing.
[0014]
The photographing camera specific device according to claim 4, In the photographing camera specific device according to any one of claims 1 to 3, said FPN detection means performs spatial filtering processing in which light and darkness of a picture which said camera captured extract a uniform imaging range, and filter data of this extracted imaging range.
[0015]
According to this composition, a photographing camera specific device is an FPN detection means, by performing spatial filtering processing, removes specific spatial frequency from an optical taken image incorporated into a photographing camera with a filter, and is improving a taken image. It can discriminate only from FPN with high precision, and this can detect it from natural pictures.
[0016]
The photographing camera specific device according to claim 5, In the photographing camera specific device according to any one of claims 1 to 4, said FPN detection means performs correlative processing between color channels which detect a portion without correlation as FPN between RGB color channels in a picture which incorporated said camera.
[0017]
According to this composition, a photographing camera specific device is an FPN detection means, and it judged that a portion with high correlation between RGB color channels was a pattern of a taken image which photoed a photographic subject, and it is judged that a portion which does not have correlation between RGB color channels is FPN. Generally, correlation of natural pictures between RGB color channels is high, and FPN does not have correlation between RGB color channels. This can discriminate from it and detect only FPN from natural pictures easily.
[0018]
The photographing camera specific device according to claim 6, In the photographing camera specific device according to any one of claims 1 to 5, said FPN detection means, An additivity FPN field primary detecting element which detects additivity FPN which has a constant level without being dependent on an image level of natural pictures in a picture which incorporated said camera, It has a multiplication nature FPN field primary detecting element which detects multiplication nature FPN from which a level changes in proportion to an image level of natural

pictures in a picture which incorporated said camera.

[0019]

According to this composition, a photographing camera specific device, Additivity FPN and multiplication nature FPN are easily computable in an additivity FPN field primary detecting element of an FPN detection means, and a multiplication nature FPN field primary detecting element by detecting average value of dark space image data in a picture, and average value of bright section image data in a picture. Thus, by calculating additivity FPN and multiplication nature FPN, by an FPN collation means, comparative collation can be individually performed with FPN stored in an FPN table storing means, and a photographing camera can be specified more correctly.

[0020]

The photographing camera specific method according to claim 7, FPN peculiar to said image sensor detected from a picture which captured an image photoed with a camera using an image sensor, is a photographing camera specific method which specifies said camera from the picture, and was captured into said camera, A camera which captured a photoed image by matching with FPN for every camera registered beforehand is specified.

[0021]

According to this method, a camera can be uniquely specified by specifying a camera which performed photography from the picture itself. Therefore, it can be specified easily with which camera a desired picture was photoed, without adding metadata or performing advanced Image Processing Division.

[0022]

[Embodiment of the Invention]

The photographing camera specific device of this invention is characterized by specifying a photographing camera using the fixed pattern noise (FPN) which appears in a taken image. That is, the photographing camera which photoed the picture is identified by making FPN peculiar to solid state image pickup devices, such as CCD, into a key. If it states in more detail, collation with FPN detected from the picture photoed by the photographing camera and FPN for every photographing camera registered beforehand will be performed, and a photographing camera will be specified by coincidence (it gets blocked and matches) of a collated result. In order to detect FPN from the photoed picture with high precision at this time, correlation between the processing corresponding to a level, time filtering, spatial filtering, or a color channel, etc. are used.

[0023]

Hereafter, the photographing camera specific system which is the 1 embodiment of this invention is explained in detail using Drawings. Drawing 1 is a fundamental lineblock diagram of the photographing camera specific system in this invention. In drawing 1, the photographing

camera specific system A of this invention. The FPN table which used FPN of the photographing camera 2 provided with solid state image pickup devices, such as CCD, and various kinds of photographing cameras as the table is stored, The server 3 which carries out comparative collation of this FPN table and the peculiar FNP contained in the picture of the photographic subject 1 which the photographing camera 2 photoed has composition connected to the networks 4, such as LAN and the Internet. FPN peculiar to the solid state image pickup device contained in the taken image from which the photographing camera 2 photoed and incorporated the photographic subject 1 by such composition is detected by the photographing camera 2, and this FPN is transmitted to the server 3 via the network 4. Then, the server 3 specifies the photographing camera 2 which has FPN corresponding to FPN which received, when collation with the FPN table which used as the table FPN which received from the photographing camera 2, and FPN for every photographing camera beforehand registered into self is performed and both match.

[0024]

Here, FPN of the taken image used when the photographing camera 2 is specified is explained. When reproducing, the pattern of the light and darkness (it does not change in time) fixed to the particular part of the picture generates the picture photoed by the solid state image pickup device of the photographing camera 2. This pattern has a peculiar pattern for every each object image sensor, and is called the fixed pattern noise (FPN). Therefore, the solid state image pickup device 2 which photoed the picture by peculiar FPN which appears in a taken image, i.e., a photographing camera, can be specified. The generation cause of FPN is produced with the photoelectric transfer characteristic of a solid state image pickup device, dispersion of dark current, the crack defect of an optical system, etc. Since especially dark current changes with temperature and dark current increases twice by 10 ** rise, if FPN and temperature characteristics which were detected are used collectively, a solid state image pickup device (getting it blocked photographing camera) can be specified in higher accuracy. The art of removing the Reason which FPN peculiar to a solid state image pickup device generates, and its FPN etc. are reported to JP,H10-313428,A, a JP,2001-86415,A gazette, etc., for example.

[0025]

Drawing 2 is a lineblock diagram showing the detailed composition of the photographing camera 2 in the photographing camera specific system A shown in drawing 1, and the server 3. In drawing 2, the photographing camera 2 has composition provided with the taken image 5 in which this photographing camera 2 photoed and incorporated the photographic subject 1 (refer to drawing 1), and the FPN primary detecting element 6 (equivalent to the FPN detection means of Claims) which will become if peculiar FPN contained in the taken image 5 is detected.

[0026]

The server 3 registers FPN peculiar to each photographing camera 2 by which it is generated when various kinds of photographing cameras 2 take a photograph, The FPN table storing part 7 (equivalent to the FPN table storing means of Claims) which uses these FPN as a table and is stored as an FPN table, It has composition provided with the FPN collating part 8 (equivalent to the FPN collation means of Claims) which carries out comparative collation of FPN which received from the FPN primary detecting element 6 of the photographing camera 2, and the FPN table stored in the FPN table storing part 7.

[0027]

FPN contained in the taken image which each photographing camera photoed, and the ID number of a corresponding photographing camera become a table of frame image data, and are registered into the FPN table. Although the FPN primary detecting element 6 is built in the photographing camera 2 and the FPN collating part 8 and the FPN table storing part 7 are built in the server 3 in this embodiment, What constituted these FPN primary detecting element 6, the FPN collating part 8, and the FPN storage 7 as a single device serves as a photographing camera specific device.

[0028]

Next, operation of the photographing camera specific system shown in drawing 2 is explained. If the photographing camera 2 photos the photographic subject 1 (refer to drawing 1) and the taken image 5 is incorporated, the FPN primary detecting element 6 will detect FPN from the taken image 5, and will transmit this FPN to the server 3 via the network 4. Then, in the server 3, the FPN collating part 8 carries out comparative collation of the FPN table stored in the FPN table storing part 7, and peculiar FPN which received from the photographing camera 2. And the FPN collating part 8 reads the ID number of the photographing camera corresponding to FNP on the FPN table which was in agreement with peculiar FNP, and specifies the photographing camera 2 which incorporated the taken image 5.

[0029]

At this time, it is very difficult for the FPN primary detecting element 6 to detect FPN from the natural pictures which are not from pictures photoed specially, such as full black, whole surface white, and gray scale, and photoed the usual scene as it is. That is, the FPN primary detecting element 6 cannot judge whether the peculiar image data contained in natural pictures (getting it blocked taken image 5) is FPN, and whether it is the photographic subject itself. Therefore, in order that the FPN primary detecting element 6 may discriminate from it and detect FPN from the taken image 5, correlation between the processing corresponding to a level, time filtering, spatial filtering, or a color channel, etc. are used.

[0030]

Here, in the processing corresponding to a level which the FPN primary detecting element 6

performs, for example, a level pinpoints the field which is black in a large imaging range, and FPN (henceforth additivity FPN) for which it does not depend on an image level from level dispersion of the pixel in the specific region but which has a constant level is detected. It can discriminate from FPN easily and this can detect it from natural pictures.

[0031]

It is based on the following Reasons that the FPN primary detecting element 6 performs time filtering. Since the picture element data of the image includes the random noise resulting from the photographing camera itself and a transmission route, if data of only one frame was detected, it cannot discriminate from random noise and FPN. Then, by what (time filtering is got blocked and carried out) time addition is carried out and the detected information of each frame is equalized for, random noise was controlled and true FPN is detected. If it puts in another way and FPN will be detected from one frame in a picture, the random noise included only in the frame will be detected as FPN. Therefore, if loud random noise by chance goes into the frame, erroneous detection of the random noise will be carried out as FPN. Then, if FPN of a lengthwise direction is detected and added by two or more frame in 1 picture and the average value is calculated as FPN of a picture, random noise peculiar to one frame will be reduced by square roots of 1/two or more. Thus, it can prevent random noise peculiar to one frame mixing as a part for the error of FPN by calculating the average value of FPN from the output for [two or more] a frame. Therefore, when the FPN primary detecting element 6 performs time filtering about the taken image 5 which should be detected, FPN peculiar to the solid state image pickup device for which it does not depend on accidental random noise is detectable.

[0032]

It is based on the following Reasons that the FPN primary detecting element 6 performs spatial filtering. That is, in spatial filtering, a spatial low pass filter extracts a comparatively uniform imaging range first, Next, only FPN of high spatial frequency is detected by filtering the data of the extracted imaging range with a highpass filter (HPF:High Pass Filter). This can discriminate from it and detect only true FPN from natural pictures. If it puts in another way, in spatial filtering, by removing specific spatial frequency with a filter, the taken image 5 will have been improved and FPN will be correctly detected from the optical taken image 5 incorporated into the photographing camera 2.

[0033]

It is based on the following Reasons that the FPN primary detecting element 6 performs correlation between color channels. Generally as for natural pictures, correlation between RGB color channels is high. On the other hand, FPN does not have correlation between RGB color channels. Then, it judges that the portion with high correlation between RGB color channels is a pattern of the taken image which photoed the photographic subject, and it is judged that the

portion which does not have correlation between RGB color channels is FPN. It can discriminate only from true FPN easily and this can detect it from natural pictures. The FPN primary detecting element 6 may carry out combining processing of correlation between the processing corresponding to a level, time filtering, spatial filtering, and a color channel, and may perform processing [which] independently.

[0034]

Next, the operation which the FPN primary detecting element 6 of the photographing camera 2 performs is explained still in detail. Drawing 3 is a lineblock diagram showing the detailed composition of an FPN primary detecting element in the photographing camera of drawing 2. As shown in drawing 3, the parameter determination part 11 with the common FPN primary detecting element 6, The additivity FPN field primary detecting element 12 which detects additivity FPN, and additivity FPN time LPF(low pass filter: Low Pass Filter) 13, It has composition provided with the FPN outputting part 16 which outputs multiplication nature FPN field primary detecting element [which detects multiplication nature FPN] 14, and multiplication nature FPN time LPF15, and additivity FPN and multiplication nature FPN to a network. That is, in order for the FPN primary detecting element 6 to detect FPN from the natural pictures of the taken image 5 with high precision, it is necessary to provide the detection system which detects additivity FPN, and the detection system which detects multiplication nature FPN.

[0035]

Additivity FPN is FPN which has a constant level without being dependent on the image level of the natural pictures in the taken image 5. Multiplication nature FPN is FPN from which a level changes in proportion to the image level of the natural pictures in the taken image 5. For example, considering FPN produced when there is amplifier (amplifying means) for every pixel of the taken image 5, dispersion in the threshold level (threshold) of amplifier becomes a cause which additivity FPN produces, and dispersion in the gain of amplifier becomes a cause which multiplication nature FPN produces.

[0036]

Next, the operation which the FPN primary detecting element 6 in drawing 3 performs is explained. When the FPN primary detecting element 6 detects FPN from the natural pictures of the taken image 5, The additivity FPN field primary detecting element 12 covers two or more frame numbers which can be set to the predetermined field of the taken image 5, detects flat dark space (black portion) as an additivity FPN detection object domain, and transmits this to additivity FPN time LPF13. That is, when the additivity FPN field primary detecting element 12 detects the dark space in an imaging range, the data below the threshold level Vd judged to be dark space is detected about two or more frames, and this data is transmitted to additivity FPN time LPF13.

[0037]
Then, additivity FPN time LPF13 carries out averaging (time-axis filtering) of additivity FPN of two or more detected frames. Thus, since averaging is performed by letting two or more detected additivity FPN pass to LPF in a time direction, true additivity FPN by which the influence of random noise and a photographing scene was eliminated is detected. At this time, the parameter determination part 11 sets up the threshold level Vd of the voltage for judging with the average value voltage Vdave of dark space image data, frame number N which carries out averaging, and dark space to additivity FPN field primary detecting element 12 and additivity FPN time LPF13. Additivity FPN of the field of dark space whose average value voltage Vdave of a desired frame number is below the voltage of the predetermined threshold level Vd is correctly detected by this.
[0038]
Next, the multiplication nature FPN field primary detecting element 14 covers two or more frame numbers (line number) which can be set to the predetermined field of the taken image 5, detects a flat bright section (white portion) as multiplication nature FPN, and transmits this to multiplication nature FPN time LPF15. Then, multiplication nature FPN time LPF15 carries out averaging (time-axis filtering) of multiplication nature FPN of two or more detected frames. Thus, true multiplication nature FPN by which the influence of random noise and a photographing scene was eliminated is detected by letting two or more detected multiplication nature FPN pass to LPF in a time direction. At this time, the parameter determination part 11 receives multiplication nature FPN field primary detecting element 14 and multiplication nature FPN time LPF15, Threshold level Vb2 of the voltage for judging with threshold level Vb1 of the voltage for judging with the minimum of the average value voltage Vbave of bright section image data, frame number N which carries out averaging, and a bright section, and the maximum of a bright section is set up. The bright section which has the average value voltage Vbave of a desired frame number within the limits of predetermined threshold level is correctly detected as multiplication nature FPN by this. That is, based on the average value voltage Vbave which is set to Vb1<Vbave<Vb2, multiplication nature FPN is detected correctly.
[0039]
And additivity FPN and multiplication nature FPN are transmitted to the server 3 via the network 4 from the FPN outputting part 16.
[0040]
What is necessary is just to use correlation of additivity FPN and multiplication nature FPN which were detected, and a corresponding FPN table about matching with additivity FPN and multiplication nature FPN which were detected as mentioned above, and an FPN table. That is, since camera ID of each photographing camera and peculiar FPN are matched and recorded on the FPN table, A photographing camera can be uniquely specified from correlation

of camera ID corresponding to additivity FPN and multiplication nature FPN which were detected, and FPN currently recorded on the FPN table.

[0041]

Drawing 4 is a flow chart which shows the flow of processing in case the FPN primary detecting element 6 detects additivity FPN of the dark space which exists in an imaging range. Drawing 5 is a flow chart which shows the flow of processing in case the FPN primary detecting element 6 detects multiplication nature FPN of the bright section which exists in an imaging range. The parameter used when explaining the flow chart of drawing 4 and drawing 5 is defined as follows, respectively, although there is also a parameter which overlaps also with the above-mentioned.

[0042]

Vfpnd (x, y) : Additivity FPN in the pixel whose coordinates are (x, y), Vfpnb (x, y) : Multiplication nature FPN in the pixel whose coordinates are (x, y), Vdave (x, y) : The average value of the dark space image data in the pixel whose coordinates are (x, y), Vbave (x, y) : The average value of the bright section image data in the pixel whose coordinates are (x, y), The frame number, Vd which carry out averaging : N: The threshold level of the voltage for judging with dark space, Vb1: -- the pressure value of the data in the threshold level of the voltage for judging with the threshold level of the voltage for judging with the minimum of a bright section, and the maximum of a Vb2:bright section, and a Vi:i frame, and the number of the i-th frame of which i:detection is done

[0043]

First, according to the flow chart of drawing 4, the flow of processing when calculating additivity FPN of dark space is explained. The taken image which the photographing camera 2 photoed first is inputted (Step S1), and the frame number i= 1 which should be detected is set up (Step S2). Next, data of the 1st frame (getting it blocked i= 1) is incorporated from a taken image (Step S3), and the voltage in the dark space of an imaging range records the frame data of Vi (x, y) which is below the threshold level Vd (step S4). Thus, the voltage data of Vi (x, y) which is below Vd one by one is recorded about the frame number i, and it is judged whether frame number N in which the frame number i carries out averaging was reached (Step S5). (it is got blocked is it i=N?) Here, if i has not reached N (in the case [Step S5] of No), processing from Step S3 to Step S5 is continued until it reaches i=N.

[0044]

On the other hand, if i has reached N at Step S5 (in the case [Step S5] of Yes) (i.e., if it is i=N), averaging of the frame data Vi (x, y) of the i-th frame which exists in every coordinates (x, y) will be carried out, Coordinates calculate the average value Vdave of the dark space image data in the pixel which are (x, y) (x, y) (Step S6). Next, the dc component contained in Vdave (x, y) with a highpass filter (HPF) is removed (Step S7). Thus, the average value Vdave of the

called-for dark space image data (x, y) can be expressed with the following formula (1).

Vdave(x, y) =Vfpnd(x, y)+1 / 2 VdxVfpnb (x, y) ... (1)

[0045]

Next, according to the flow chart of drawing 5, the flow of processing when calculating multiplication nature FPN of a bright section is explained. The taken image which the photographing camera 2 photoed first is inputted (Step S11), and the frame number i= 1 which should be detected is set up (Step S12). And the data of the 1st frame of a taken image is incorporated (Step S13), and the voltage in the bright section of an imaging range records the frame data of Vi (x, y) which are the one or more threshold level Vb, and is the two or less threshold level Vb. That is, the frame data Vi (x, y) which is set to Vb1<Vi(x, y) <Vb2 is recorded (Step S14). Thus, the voltage data of Vi (x, y) which are one or more Vb(s) and two or less Vb one by one is recorded about the frame number i, and it is judged whether frame number N in which the frame number i carries out averaging was reached (Step S15). (is it i=N?) Here, if i has not reached N (in the case [Step S15] of No), processing from Step S13 to Step S15 is continued until it reaches i=N.

[0046]

On the other hand, if i has reached N at Step S15 (in the case [Step S15] of Yes) (i.e., if it is i=N), averaging of the frame data Vi (x, y) of the i-th frame which exists in every coordinates (x, y) will be carried out, Coordinates calculate the average value Vbave of the bright section image data in the pixel which are (x, y) (x, y) (Step S16). Next, the dc component contained in Vbave (x, y) with a highpass filter (HPF) is removed (Step S17). Thus, the average value Vbave of the called-for bright section image data (x, y) can be expressed with the following formula (2).

Vbave(x, y) =Vfpnd(x, y)+1 / 2(Vb2-Vb1)xVfpnb (x, y) ... (2)

[0047]

By solving the above-mentioned formula (1) and formula (2) which were called for, as it described above, Vfpnd (x, y) which is additivity FPN, and Vfpnb (x, y) which is multiplication nature FPN can be calculated. Hardware can be constituted, it can also realize and processing which calculates additivity FPN of dark space as shown in drawing 4, and processing which calculates multiplication nature FPN of a bright section as shown in drawing 5 can also be realized as software. The input signal level inputted into a photographing camera and the output signal level outputted from a photographing camera may not be in proportionality. Thus, in the case of the gamma characteristic that the relation between an input signal level and an output signal level is nonlinear, it is necessary to perform a gamma correction (getting it blocked DEGAMMA processing) in the preceding paragraph of an input signal level. For example, since the optical power which emits light from the fluorescent substance of a television picture tube is proportional to the 2.2nd power of the current added, it is necessary

to make the input output signal levels of a camera into proportionality by performing the amendment which is inversely proportional to the 2.2nd power by the camera side, i.e., a gamma correction, (DEGAMMA processing). That is, it is required by performing such a gamma correction (DEGAMMA processing) to detect FPN more correctly.

[0048]

The embodiment described above is an example for explaining this invention, this invention is not limited to the above-mentioned embodiment, and various modification is possible for it in the range of the gist of an invention. For example, the threshold level Vd of the voltage for judging with dark space which the parameter determination part 11 determines in drawing 3, It is necessary to select suitably parameters, such as threshold level Vb2 of the voltage for judging with the maximum of threshold level Vb1 of the voltage for judging with the minimum of a bright section, and a bright section, and frame number [which carries out averaging] N, according to a system, an inputted image, etc. of the whole photographing camera. About the concrete value of each parameter, it is desirable to determine the optimal value based on an experiment etc.

[0049]

Although the image pick was incorporated directly and FPN is detected with the photographing camera 2 in this above mentioned embodiment, With for example, the photographing camera specific device which constituted the FPN primary detecting element 6 built in the photographing camera 2, the FPN collating part 8 built in the server 3, and the FPN storage 7 as a single device. The camera which detected and photoed FPN can be specified using the recording tape etc. which are prepared beforehand.

[0050]

[Effect of the Invention]

As explained above, the photographing camera specific device of this invention can specify a photographing camera by peculiar FPN contained in the picture which the photographing camera photoed, without adding metadata to a photographing camera. It can be specified uniquely with which camera the desired image was photoed, without performing performing complicated work sequence and advanced Image Processing Division by this. In order to amend two-dimensional FPN, it usually becomes a frame memory and a factor which a multiplier is needed, respectively if it is additivity FPN and is an adding machine and multiplication nature FPN, and pulls up cost, power consumption, etc. of a camera as a result at least. However, according to the photographing camera specific device of this invention, a possibility of pulling up cost, power consumption, etc. of a camera disappears by amending the characteristic of a camera by post-processing, although a photographing camera is specified. Protection and management of copyright can also be performed by using specification of a photographing camera for copyright management.

[Brief Description of the Drawings]

[Drawing 1]It is a fundamental lineblock diagram of the photographing camera specific system in this invention.

[Drawing 2]It is a lineblock diagram showing the detailed composition of the photographing camera in the photographing camera specific system shown in drawing 1, and a server.

[Drawing 3]It is a lineblock diagram showing the detailed composition of an FPN primary detecting element in the photographing camera of drawing 2.

[Drawing 4]It is a flow chart which shows the flow of processing in case an FPN primary detecting element detects additivity FPN of the dark space which exists in an imaging range.

[Drawing 5]It is a flow chart which shows the flow of processing in case an FPN primary detecting element detects multiplication nature FPN of the bright section which exists in an imaging range.

[Description of Notations]

1 Photographic subject
2 Photographing camera
3 Server
4 Network
5 Taken image
6 FPN primary detecting element (FPN detection means)
7 FPN table storing part (FPN table storing means)
8 FPN collating part (FPN collation means)
11 Parameter determination part
12 Additivity FPN field primary detecting element
13 Additivity FPN time LPF
14 Multiplication nature FPN field primary detecting element
15 Multiplication nature FPN time LPF
A Photographing camera specific system

[Translation done.]